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INTERGOVERNMENTAL NEGOTIATING COMMITTEE
FOR A FRAMEWORK CONVENTION ON CLIMATE CHANGE
Tenth session
Geneva, 22 August - 2 September 1994
Item 4 (a) of the provisional agenda

MATTERS RELATING TO ARRANGEMENTS FOR THE FINANCIAL MECHANISM AND FOR TECHNICAL AND FINANCIAL SUPPORT TO DEVELOPING COUNTRY PARTIES

IMPLEMENTATION OF ARTICLE 11 (FINANCIAL MECHANISM), PARAS. 1-4

Synthesis report on adaptation

Note by the interim secretariat

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I. INTRODUCTION

A. Committee mandate

1. At its ninth session, the Committee stressed the importance it attached to the commitment of Annex II Parties to assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to those adverse effects. With regard to Article 4.4, the Committee recognized the need for more information on and further analysis of the meaning of adaptation (including preparation for and facilitation of adaptation) as well as on the particular measures which might be considered. It was concluded that such information and analysis could contribute to a better understanding of the range of issues and funding decisions under Article 11 that are associated with adaptation. The Committee asked the interim secretariat to seek further information from countries, international organizations and relevant groups and to produce a synthesis document for consideration by the Committee at its tenth session (A/AC.237/55, para. 89).

2. The Committee also decided "that the question of methodological issues should be reviewed at its eleventh session in the context of its final recommendations to the [Conference of the Parties] COP, taking into account that such methodologies would continue to evolve in the light of improved scientific understanding and practical experience, and further decides to invite the [Intergovernmental Panel on Climate Change] IPCC to continue its work on methodologies particularly those relating to inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases, not controlled by the Montreal Protocol, [global warming potentials] GWPs of those greenhouse gases, vulnerability assessment, adaptation and projection of emissions by sources and removals by sinks, and to study methodologies for the evaluation of the effects of measures" (A/AC.237/55, annex I, decision 9/1, para. 1(d)).

3. Committee decision 9/1, para. 3(b) requested "the interim secretariat to prepare documentation for consideration by the Committee at its eleventh session on the work currently underway in relevant bodies, including the IPCC, relating to methodologies on the issues referred to in paragraph 1(d) (quoted) above and on methodological issues including draft recommendations to the Conference of the Parties at its first session on the decisions of the Committee and relevant new information" (A/AC.237/55, Annex I, decision 9/1, para. 3(b)).

B. Scope of the note

4. The present note recalls Convention provisions that are relevant to adaptation, provides elements of background, addresses possible impacts of a greenhouse gas build-up as well as a number of adaptive responses to the risks of rapid climate change.

5. A status report on current studies and activities on the impacts of climate change and methodologies for adaptation being carried out by IPCC and the United Nations Environment

Programme (UNEP) are given in the annex to this note because of its relevance to the discussions of the Committee. The annex will also be relevant to the work of the Committee at its eleventh session.

C. Possible action by the Committee

6. The Committee may wish to take into account information contained in this note as well as that submitted by Governments or Groups thereof contained in document A/AC.237/Misc.38 and A/AC.237/Misc.38/Add.1 and to continue its consideration of the subject of the eligibility of adaptation activities for funding under the financial mechanism. The Committee may also wish to take note of the contents of the annex, as it may be useful advance information prior to the Committee's discussion on methodologies for adaptation at its eleventh session.

II. ADAPTATION TO CLIMATE CHANGE

A. Convention provisions

7. The problems associated with adaptation to the impacts of human-induced climate change are referred to both directly and indirectly in the United Nations Framework Convention on Climate Change. Article 3.3 of the Convention states that "the Parties should take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects..."

8. Article 4, paragraph 1 requires all Parties to take a variety of measures to prepare for and facilitate adaptation to the impacts of climate change. Subparagraphs (b), (d), (e) and (g) are relevant in this regard.

9. It is important to note that all measures covered by Article 4.1 are eligible for funding through the financial mechanism of the Convention, in accordance with Article 4.3. In addition, Article 4, paragraph 4 states that "the developed country Parties and other Parties included in Annex II, shall also assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects."

10. In Article 4, paragraph 8, the Convention states that "In the implementation of the commitments in this Article, the Parties shall give full consideration to what actions are necessary under the Convention, including actions related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and/or the impact of the implementation of response measures..." Various types of technology transfer, including the transfer of technologies related to adaptive responses (such as improved agricultural and plant breeding techniques) are likely to

be useful. Co-development and accelerate transfer of such technologies have been cited as a potentially cost-effective means of capturing significant long-term benefits at both the national and global level.

B. Background

11. Adaptation can be understood in the context of the Convention to include all purposeful and deliberate activity taken in response to or in anticipation of the adverse impacts of rapid climate change. It also refers specifically to responses by humans (as opposed to the spontaneous adjustments made by natural systems in response to changes in climate or to other changes in the environment).

12. Climate change has been occurring at the regional, continental and global scale for thousands of millennia, but rates of change have varied dramatically. Throughout geologic history, the Earth has passed through major climate changes, moving periodically from frozen ice ages to warmer, more equable periods. These natural climate changes have occurred in a pattern that many observers believe is synchronized with shifts of our planet's position in its celestial orbit. Most of these climate changes have occurred relatively slowly. The geologic evidence suggests that changes in average annual surface temperature as large as 5°C have occurred in the past, usually occurring gradually over thousands of years.

13. Changes in average global surface temperature which occur at rates of a few tenths of a degree centigrade per century are gradual enough that natural systems can usually adapt smoothly to the new conditions. Some evidence of more rapid rates of change has recently emerged from analyses of air trapped in glacial ice. These data suggest that naturally-induced climate changes of several degrees centigrade might have occurred in the past during periods of one hundred years or less, at least in the northern hemisphere. Any future rate of change that is equally rapid would severely stress the ability of human societies and natural ecosystems to adjust in a smooth, spontaneous and successful fashion.

14. In the last decade, a strong consensus has emerged in the international scientific community that emissions of greenhouse gases from human activities are changing the composition and behaviour of the atmosphere. Many scientists now believe that if these trends continue, the resulting build-up of greenhouse gases threatens to instigate rapid and disruptive climate changes in the next century. Consideration of the impacts of such a rapid, anthropogenic climate change was a significant element of the stimulus for negotiating the United Nations Framework Convention on Climate Change, which entered legally into force in March 1994. Further concerns about the risks of rapid climate change have motivated governments to continue to support the Intergovernmental Panel on Climate Change (IPCC). The IPCC is currently reviewing the state of the science concerning the climate system evaluating various means to slow the trends in atmospheric build-up of greenhouse gases, and analysing cost-effective, adaptive responses to climate change. This process will lead to the publication of the IPCC's Second Scientific Assessment Report in 1995.

15. Many scientists now believe that by implementing a combination of mitigative and adaptive strategies in response to the risks of rapid future climate change, governments can promote sustainable development while reducing the expected value of damages to both human societies and natural ecosystems that might otherwise result from the impacts of a greenhouse gas build-up. It has been suggested that such a combined approach will be the most effective means of dealing with climate change.

C. Potential impacts of a greenhouse gas build-up

16. The IPCC has identified several important types of impacts that might occur as a result of a continuing human-induced enhancement of the natural background greenhouse effect. Molecules of carbon dioxide, methane, nitrous oxide, chlorofluorocarbons (CFCs) and other greenhouse gases contribute differing amounts to the enhanced greenhouse effect. The IPCC has estimated that when the heat-trapping effect of the combined build-up of these gases reaches a level that is equivalent to doubling the pre-industrial concentration of carbon dioxide alone, the average annual surface temperature of the planet will increase by approximately 2-5°C, relative to the pre-industrial level. A warming of approximately 0.3-0.6°C (relative to the pre-industrial level) has already been observed. Under the IPCC 1990 Business-As-Usual Scenario, the average rate of increase in global surface temperature during the next century was projected to be 0.3°C per decade (with an uncertainty range of 0.2-0.5c per decade).

17. The principal consequences of global warming due to the enhanced greenhouse effect are expected to be visible mainly as an alteration in the location, frequency, severity and duration of presently observed phenomena such as droughts, floods, temperature peaks, sea-water invasion of terrestrial areas, shifts in the frontier of traditional agroclimatic zones, and changes in agricultural yields. Not all regions nor all population groups within a region will be affected in the same way by future climate change. The extent of the damage that occurs as a result of the impacts of climate change will depend on the particular vulnerability of the affected populations, ecosystems and economies. Thus, climate change is likely to have important and differential impacts on equity among citizens, both within countries and between countries.

18. The IPCC predicts that under the 1990 Business-As-Usual Scenario, the average rate of increase in the global mean sealevel would be approximately 6 cm per decade (with an uncertainty range of 3-10 cm per decade). Changes in regional sealevel at the boundaries of coastal zones will vary. These regional changes will be affected by the movement of Earth's tectonic plates and by the local management of human settlements close to the ocean's edge.

19. In addition to changes in sealevel, the IPCC predicts that climate changes due to the enhanced greenhouse effect could include significant changes in the timing, location, and distribution of rainfall and snowfall. For the planet as a whole, the enhanced greenhouse effect is likely to amplify precipitation within the global hydrological cycle. But individual regions may experience more or less precipitation in the future than they have in the past. The future pattern of these changes in regional precipitation cannot now be predicted with confidence.

20. Global warming due to the enhanced greenhouse effect may also cause shifts in the patterns of upper atmospheric winds and ocean currents. Recent research suggests that these patterns generate "teleconnections," processes that link, for example sea surface temperatures in the eastern Pacific Ocean with the incidence of rainfall in southern Africa. Changes in these patterns of winds and ocean currents might thus alter the frequency, severity and duration of extreme weather events including regional episodes of hurricanes, typhoons, storm surges, hot spells, cold snaps and severe windstorms.

21. Large or rapid changes in global and regional climate regimes could have significant impacts on natural ecosystems and human economies. If climate change occurs more rapidly than the rate at which natural systems can adapt by migration, behavioural adjustment or genetic mutation, some species may find that their current and traditional habitats have become intolerable. These species may be trapped in conditions so inhospitable that large numbers of individual plants and animals may perish or cannot produce a new generation of offspring. In some cases, whole species could become extinct if they cannot find another satisfactory habitat or adapt to a new niche within the boundaries of an accessible ecosystem.

22. The impacts of rapid climate change could impose high economic costs. Coastal flooding or inland inundation due to sealevel rise could cause damaging and destructive floods in low-lying deltaic regions and could cause whole island states to be submerged in the sea. Shifts in the regional pattern of rainfall and snowfall could significantly reduce annual flows of surface water and runoff, with the potential to decrease the productivity of economically-important forests and to devastate regions that have traditionally supported rain-fed agriculture and affect the quality, quantity and security of drinking water supply. Increases in the frequency or severity of extreme weather events could cause extensive damage, especially in developing countries. Hot spells, cold snaps or heavy rains during vulnerable periods could cause whole crops to be lost. Changes in rainfall could reduce the availability of local waterways to support regional transport by boat or barge. And increases in temperature could impose higher demands for energy to store agricultural products and pharmaceuticals or to cool buildings.

23. Climate change may also have significant impacts on public and animal health. Changes in regional climates may allow pests and vectors of disease to colonize new areas and, in particular, to over-winter in areas from which they have been traditionally excluded by cold winter temperatures. Preliminary research suggests that global warming due to the greenhouse effect could increase the range and severity of human exposure to cholera, schistosomiasis, yellow fever, Rift Valley fever, arbovirus-related encephalitis, river blindness, malaria and dengue fever. In addition, the spread and virulence of livestock diseases such as blue tongue, encephalitis, influenza, equine infectious anaemia, vesicular stomatitis and tick-borne diseases may increase significantly in some areas.

24. If the impacts of climate change disrupt the ability of particular regions to support the economic needs of their populations, rapid climate change could lead to a significant increase in the numbers of human refugees. Forced migration of environmental refugees could have the

potential to increase intraregional and interregional tensions and, ultimately, to expand the prospects for conflicts over resources.

25. It has been observed that, in the developing world at least, it is not possible to deal with the impact of climate change as a sectoral issue. Moreover, within and across countries impacts tend to be more severe for the poor than for the rich who find it easier to mobilize resources needed for adaptive responses. Adaptive responses to climate change can, however, be incorporated into long-term development planning if the link between future climate change and the impacts of present climate variability can be established. In this context, climate change can be viewed as one component of a general sustainable development strategy which aims at increasing national and regional capacity to deal with climate variability as well as long-term climate change. The essential element in such a strategy is a programme of measures to increase the capacity of each individual and community to react in a resilient manner to critical and unexpected events as they occur, whether they occur as a consequence of natural climate variability or as an early impact of long-term climate change.

D. Adaptive responses to the risks of rapid climate change

26. Scientists have characterized several different types of adaptive responses to the impacts of climate change. The IPCC has identified three main types of activity that could increase the resilience of human societies in the face of climate change and reduce the economic damages that result from those future changes which are already unavoidable. Among these adaptive response strategies are:

(a) Retreat - including actions to move people away from vulnerable or affected areas;

(b) Protection - including actions to shield the vulnerable area or activity from the impacts of climate change; and

(c) Accommodation - including actions to protect an area or activity that is thought to be at risk of damage due to climate change.

27. Within the range of accommodation activities, two further subjects may be identified. These include:

(a) National strengthening - actions to increase the resilience of human societies, local institutions, or specific activities that are exposed to the impacts of rapid climate change as well as actions to maintain traditional ecosystem functions in the face of future environmental change; and

(b) Substitution - actions to replace current activities with measures suitable for the new conditions.

28. Among the submissions received from Governments is the following proposal: A policy framework for addressing adaptation should be developed by the Committee and the COP to deal with:

(a) Developing an agreed definition of adaptation;

(b) Implementing short term adaptation activities;

(c) Continuing research into potential impacts and priority given to identifying framework of high risk and vulnerability;

(d) The longer term scope of adaptation; and

(e) The identification, possible implementation and funding of measures to reduce vulnerability and prepare for adaptation as a longer term response.

The emphasis in the short term should be on emissions limitation across all relevant sectors, combined with an initially limited and focused set of adaptation actions, e.g., planning measures, capacity building and institutional strengthening. Specific measures regarding coasts and terrestrial resource use and management are also mentioned. (See submission from Australia and New Zealand, A/AC.237/Misc.38.)

29. Another submission from a group of countries recommended the following:

(a) The development and adoption by the COP of an indicative list of the incremental adaptation costs to be funded under the Convention for transmittal to the Global Environment Facility;

(b) The development and adoption by the COP of methodologies for the calculation and verification of the provision of new and additional resources by developed country Parties for inclusion in their national communication of information;

(c) The development of mechanisms for the coordination of bilateral, multilateral and regional financial institutions under the authority of the COP, to assist small island developing countries meet costs of adaptation;

(d) The consideration and adoption by the COP of an insurance mechanism to assist in meeting costs of adaptation to the adverse effects of climate change;

(e) The development and adoption of a protocol to the Convention on integrated coastal zone management, clarifying agreed approaches to adaptation costs and related financial resources. (See submission from Trinidad and Tobago on behalf of AOSIS in document A/AC.237/Misc.38.)

30. The following paragraphs offer some examples of adaptive responses to the risks of rapid climate change. This set of examples is meant to be highly illustrative, and certainly not exhaustive.

31. In the area of coastal zone management, the IPCC has identified opportunities for all three types of adaptive responses: retreat, protection and accommodation. Suggestions have been made concerning ways in which such responses might be implemented. In this context, retreat implies moving people and ecosystems inland, away from a vulnerable coastal zone. Protection refers to the construction of site-specific features such as sea walls, dykes, dunes and vegetation to protect the area. Accommodation implies here that no attempt would be made to protect the vulnerable coastal region, but "defensive" measures would be taken to allow for its continued habitation and use. Such measures might include raising buildings onto pilings or platforms, converting agricultural activities to less sensitive schemes and promoting fish "farming".

32. Adaptive responses to sealevel rise that are designed to decrease local vulnerability to climate change might also include measures to prevent the mining of coral and the clearing of mangrove swamps, both of which can act as a natural buffer against the ravages of storm surges. Other impacts of sealevel rise –such as salt water intrusion into estuaries – might have a negative impact on coastal wetlands and on traditional fisheries, with important consequences for human use of the coastal zone.

33. In agriculture, the range of adaptive responses to climate change identified by the IPCC includes changes in land use, changes in management practices and changes in policies of agricultural support.

34. Among changes in land use, the IPCC identifies three sub-categories: changes in farmed area, changes in crop type and changes in crop location. Changes in crop location that shift existing crops into areas that become more suitable for agriculture under the new climate regime may help to maintain traditional yields or even to improve them. Changing crop types to more drought-resistant varieties may allow farmers to sustain yield levels while introducing improved water-management practices.

35. Similarly, adaptive responses in the forestry sector include changes in tree species and shifts in management practices. Changing tree species can sometimes maintain yields, even in the face of altered climate conditions. Increasing forested areas can cause aggregate yields to increase if the effort helps to restore degraded lands or brings lightly-managed marginal land into a programme of balanced and sustainable yield management.

36. A wide variety of adaptive responses are available in the energy sector. On the demand side, for example, as average temperatures increase, one option is to convert buildings from active mechanical cooling systems to passive solar architecture. Fuel shifting may be particularly important in the short to medium term. Shifting national consumption to sources

derived from renewable energy sources may also be a part of larger, long-term national programmes to substitute one agricultural activity (i.e., growing biomass for energy) for another (i.e., growing biomass for food). The benefits of such a programme of substitution could include, as in the case of the Brazilian ethanol programme of the 1980s, increases in local employment, insulation of the local economy against unexpected increases in the international price of competing fuels and savings of local reserves of hard currency.

37. Adaptive responses to the risk of changes in future water supply include measures that increase the efficiency of local water use and programmes that recycle water among activities with sequentially less stringent demands for water quality. Such adaptive responses will have many economically important benefits. In particular, such strategies can help to stretch whatever run-off is available to cover the full range of important uses, including demands for drinking water, agricultural irrigation and industrial production.

38. Adaptive responses can increase human and animal resilience to infections caused by more virulent or more widespread vectors of disease. Such responses might include measures to control the habitats or change the conditions that allow the vectors to breed and spread. Responses could also include research on vaccines to prevent infection as well as treatments of affected individuals. Additional responses could include programmes to increase public health awareness, to provide clean and potable water, and to improve the handling of food and medicines.

E. Global benefits of adaptive response strategies

39. Adaptive response measures have largely local and national benefits because they reduce the local economic cost of damages resulting from the impacts of human-induced climate change. However, some adaptive responses may also generate global benefits. Actions associated with locally-motivated adaptive responses sometimes simultaneously support national mitigation strategies. Such responses may reduce the risk of rapid climate change by limiting the rate of growth in emissions or enhancing the natural sinks of greenhouse gases. In addition, some adaptive responses to the risks of rapid climate change may offer benefits in terms of other global environmental problems. For example, measures to protect mangrove swamps from the risks that are presented by sealevel rise may also help to reduce the risk of future loss of biological diversity.

40. Changes in the location of agricultural areas and changes in crop types may have a global benefit if they are accompanied by reductions in soil-related emissions of greenhouse gases. Changes in agricultural management practices may also provide both local and global benefits. Such changes will probably be designed principally to maintain or increase local food yields. But adaptive responses can also shift local production to lower levels of the chemical inputs to agriculture that contribute to greenhouse gas emissions or cause smaller areas to be inundated during periods of irrigation. Such responses could thus result in a decrease in emissions of nitrous oxide or methane from the soil. In addition, changes in cultivation

practices which limit the future rate of soil erosion may enhance carbon uptake and reduce carbon mobilization from soil to air.

41. Adaptive responses in the forestry sector may also support national efforts to mitigate greenhouse gas emissions. If forested area is expanded, the enhanced sink capacity during the growth of the "new" forest may represent an important vehicle for slowing the rate of greenhouse gas build-up in the atmosphere. This global benefit could accrue long before the trees are ready for any economic harvesting. The benefit could occur whether the new growth resulted from reclaiming degraded lands through reforestation or upgrading marginal lands through afforestation programmes. Because indigenous people may have previously used the "degraded" lands and their traditional uses will be displaced, understanding the historical patterns of local land tenure and use is critical to determining the existence and the magnitude of any such global benefit.

42. Adaptive responses in the energy sector may also deliver global benefits by helping to mitigate future greenhouse gas emissions. Efforts to shift architectural practices toward passive solar architecture may help to make the built environment more liveable at the same time that it reduces the scale of likely emissions of CFCs and other harmful substances from refrigeration and cooling equipment. Efforts to grow biomass for energy may increase the uptake of atmospheric CO_2 on land that was previously degraded, lightly managed or economically unproductive. In general, measures which substitute renewable fuels for fossil fuels may not only provide local benefits in terms of increased employment and reduced demands for hard currency in the energy sector, they may also reduce emissions that would have resulted from fossil fuel consumption to provide the same energy services.

43. Adaptive responses to new demands for managing water resources may provide both local and global benefits. Some analysts have suggested that changes in regional water availability due to the effects of a greenhouse warming could significantly increase inter and intraregional tensions in the next several decades. To the extent that increases in regional cooperation and improvements in regional water management practices can help to build confidence and reduce tensions among riparian states in a region, these adaptive responses will reduce the likelihood that the impacts of climate change on local water supplies will lead to conflicts which could spread beyond the region. This type of increase in regional security could be viewed as a significant global benefit.

44. Adaptive responses to reduce the risks of disease to humans and animals may have regional and global benefits as well as local effects. If such measures reduce the economic and human costs of damages to local economies, they will have clear domestic benefits. However, since the particular regions which will be affected by such outbreaks cannot be identified today with confidence, measures taken to control the spread and severity of diseases whose

vectors may be strengthened as a result of global climate change could also significantly reduce the risk of widespread regional or global epidemics in the future and facilitate the reduction of environmental pressure to migrate (see paragraph 24).

F. Funding for adaptive response strategies under the Convention.

45. The eligibility of adaptation activities for funding under the financial mechanism of the Convention is still the subject of discussion by the Committee. Attention is drawn to submissions from the Governments of Australia and New Zealand, Trinidad and Tobago (on behalf of the Alliance of Small Island States) and Germany (on behalf of the European Community and its member States) on this issue, which can be found in documents A/AC.237/Misc.38 and A/AC.237/Misc.38/Add.1.

Annex

CURRENT STATUS OF STUDIES AND ACTIVITIES OF IPCC AND UNEP ON THE IMPACTS OF CLIMATE CHANGE AND MEASURES FOR ADAPTATION

Intergovernmental Panel on Climate Change (IPCC)

1. The IPCC Secretariat, gratefully acknowledging the inputs from the Technical Support Unit of IPCC Working Group II, has submitted the following:

Background

2. The Working Group II portion of the 1995 IPCC Second Assessment Report is being written in 31 chapters and appendices. In addition to those chapters focusing on mitigation options, some 20 chapters deal with assessing sectoral impacts and adaptation options or develop generic methodologies for assessment of impacts and measures for adaptation. Sectoral impacts encompass the potential physical, biological, ecological and socio-economic effects of possible changes in climate.

3. Expert peer review of the first drafts will take place in August-September 1994. The second drafts will be available for governmental review during the first quarter of 1995, with final adoption of the report by the IPCC scheduled for September 1995.

Assessment of potential impacts

4. A wide range of research is being assessed: laboratory and field experiments on the potential effects of elevated CO_2 concentrations on the physiology of a wide range of plants; models which relate natural variation in vegetative cover or crop productivity to climate variability; analyses of the potential impacts of climate change on the provision of ecosystem services such as recycling water, assimilating wastes, preserving biodiversity and providing natural resources; and studies on the potential ramifications of climate change in specific socio-economic sectors such as agriculture, forestry, transportation, fisheries, water resources and human health.

5. To the extent allowed by the literature, the assessments will develop quantitative analyses of potential impacts. It is important not to raise unreasonable expectations, however, as in many cases approaches for quantifying sensitivities, thresholds and impacts do not yet exist. It is also important to note that this work on impacts assessment is being undertaken in conjunction with assessment of options for mitigating greenhouse gas emissions in a variety of managed environmental systems and socio-economic sectors.

6. Assessment of potential climate-change impacts is a crucial first step in the analysis of adaptation options as it allows decision-makers to incorporate information about the uncertainties posed by potential climate changes into long-term planning for resource use. This will make it possible to prepare for the wide range of potential future conditions which may be possible.

Assessment of adaptation options

7. Adaptive responses being considered include technical responses, institutional changes, economic adjustments and regulatory instruments.

8. These responses can be classified in six broad groups:

(a) Prevention of loss, involving anticipatory actions like controlled coastal zone retreat to prevent wetlands from sealevel rise;

(b) Tolerating loss, where short-term adverse impacts are absorbed without permanent damage;

(c) Sharing loss, where the adverse effects are distributed over a larger region or population beyond the immediate victims (e.g., disaster relief);

(d) Changing activity, involving a switch away from activities which are no longer viable in the changed climate;

(e) Changing location, for example re-siting a hydro-electric plant due to shift in water patterns; and

(f) Restoration, which aims to restore a system to its condition prior to damage by climate events.

9. An alternative method of classification is based on the scope of the adaptation strategies. Long range strategies are pertinent to issues involving mean changes in climate such as river basin planning. Tactical strategies are concerned with mid-term considerations of climate variability like flood proofing. Finally, contingency strategies address short-term climate extremes like emergency drought management. The viability of many of these options is dependent on legislation or influenced by prevailing social norms which may encourage, restrict or even prohibit their use.

10. To the extent allowed by the literature and extant methodologies, the assessment will provide an indication of the uncertainties associated with the adaptation options that are considered.

11. With respect to procedures for formulating national and regional adaptation policies, it may be recalled that the IPCC had published its Preliminary Guidelines for Assessing Impacts of Climate Change in 1992. Drawing upon its reviews and past planning experiences, a new framework, namely, "Technical Guidelines for Assessing Climate Change Impacts and Adaptations", has been developed to include techniques for evaluation of adaptation options. These techniques include simulation models, historical evidence, surveys and expert judgement. Uncertainty analysis and risk assessment are included in the evaluation process.

12. The Technical Guidelines are now undergoing peer and governmental reviews. It is expected that these Guidelines will form part of the IPCC Special Report and be available to COP 1.

United Nations Environment Programme (UNEP)

13. UNEP is cooperating with the IPCC in the development and further refinement of the "IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations". It has started to develop a handbook on methods for assessing impacts of climate change and adaptation, which shall complement the IPCC guidelines. This handbook will describe in a step by step manner the application of various methods referred to in the IPCC guidelines, giving sufficient information on data and resource requirements, and describing advantages, limitations and risks of a certain method. Recommendations will be included on possible combinations of methods in order to achieve the most reliable results. An annex describing the application of the methods in completed and ongoing studies as well as a detailed list of references will complete this handbook.

14. Attention will be given to specific methods for sectoral studies such as agricultural productivity and food security, hydrology and water resources, forestry, human settlements and natural ecosystems. Methods for testing the effectiveness of adaptation measures in reducing vulnerability and the integration of the issue of impacts of climate change and adaptation in the wider context of environmental impact assessment will be addressed.

15. The handbook will be available by the end of 1995. Since further developments and improvements of methods for assessing climate impacts and adaptation measures are expected due to increased efforts in climate related country studies, the handbook can be seen as a living document that will be improved and revised according to progress achieved in climate impact science.

16. UNEP has also developed a country case studies programme to apply and test the guidelines and the methods recommended by the IPCC in a set of country case studies.

17. The experience gained from the application of the guidelines and methods under field conditions in different countries will provide important inputs for the further refinement of the IPCC guidelines and the handbook on methods. The advantages and limitations of methods and the applicability of certain approaches under various conditions will be assessed. This process of testing and refinement will ensure a broad applicability of the guidelines and methods for assessing climate impacts and evaluating adaptation measures.